PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 7 : A47B 91/02, 91/16, E06C 7/44, F16M 11/24, 11/26 — A1

(11) International Publication Number: WO 00/59344

(43) International Publication Date: 12 October 2000 (12.10.00)

(21) International Application Number: PCT/AU00/00273

(22) International Filing Date: 31 March 2000 (31.03.00)

(30) Priority Data:

PP 9601	1 April 1999 (01.04.99)	AU
PQ 1263	29 June 1999 (29.06.99)	AU
PQ 3681	28 October 1999 (28.10.99)	AU

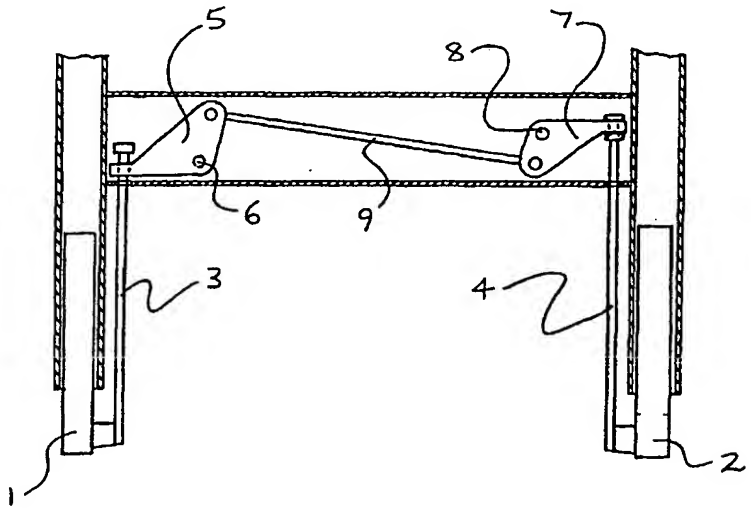
(71)(72) Applicant and Inventor: GWYNNETH, Mark [AU/AU]; 24 Suttor Street, Ainslie, ACT 2602 (AU).

(81) Designated States: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published

With international search report.
With amended claims.

(54) Title: SELF STABILISING SYSTEM



(57) Abstract

A levelling and/or stabilising assembly for levelling and/or stabilising an apparatus supported on an uneven surface on a plurality of supports, the assembly including: an adjustable member (1) on one of the supports, the adjustable member adopting a position in contact with the surface when the apparatus is supported thereon; locking means (3) for locking the adjustable member against movement relative to the one support, and a trigger member (2) on another of the supports, the trigger member effecting locking of the locking means when actuated upon contact with the surface when the apparatus is supported thereon.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece			TR	Turkey
BG	Bulgaria	HU	Hungary	ML	Mali	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MN	Mongolia	UA	Ukraine
BR	Brazil	IL	Israel	MR	Mauritania	UG	Uganda
BY	Belarus	IS	Iceland	MW	Malawi	US	United States of America
CA	Canada	IT	Italy	MX	Mexico	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NE	Niger	VN	Viet Nam
CG	Congo	KE	Kenya	NL	Netherlands	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NO	Norway	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	NZ	New Zealand		
CM	Cameroon			PL	Poland		
CN	China	KR	Republic of Korea	PT	Portugal		
CU	Cuba	KZ	Kazakstan	RO	Romania		
CZ	Czech Republic	LC	Saint Lucia	RU	Russian Federation		
DE	Germany	LI	Liechtenstein	SD	Sudan		
DK	Denmark	LK	Sri Lanka	SE	Sweden		
EE	Estonia	LR	Liberia	SG	Singapore		

SELF STABILISING SYSTEM

Technical Field

This invention relates to a self-stabilising system. It has particular but not exclusive application to a self-stabilising and self-locking mechanism for an assembly supported on a surface by a four-based structure of legs or feet. It has particular but not exclusive application to self-stabilising mechanisms for tables, ladders, stools, trestles, and numerous other four-footed structures, including, but not limited to, all others further identified in this document.

Background of Invention

Tables and four-footed structures in general are often subject to uneven floors or various uneven supporting surfaces, causing them to wobble to some degree. Too often the solution involves placing cardboard or some form of shim under one of the feet. This is an annoyance and only a temporary solution. This is a problem that has needed an effective means of correcting it.

Numerous inventions have attempted to solve this problem, including:

Winters	US Patent No. 5,690,303;
Humphreys	US Patent No. 467,811;
Henderson	US Patent No. 3,204,906;
Junkunc	US Patent No. 3,117,392;
Whitman	US Patent No. 2,787,087;
Price	Australian Patent No. AU-A-36001/89.

The above have proposed solutions for table wobble but in practice, from a stability point of view, these operate similar to a three footed structure, as pressure placed from the top down on the corner of the table, on the side with the adjustable piece, can cause the table to become unbalanced, and there is no satisfactory locking mechanism. These proposed solutions can not achieve the desired stability and the ease of automatic self-adjustment.

Others have proposed solutions including:

Derby US Patent No. 2,890,824;

Balcar US Patent No. 2,835,427;

Forristall US Patent No. 4,095,671.

These are all ladder-leveling systems, with respective friction binding methods, and can not be applied effectively to four footed structures as they have two adjustable legs, requiring two locking mechanisms. While the ladder-type construction may work well for two footed applications they are not suitable for four footed structures. One disadvantage is that one locking mechanism will generally engage before the other thus creating an imbalance in the final settlement of the four footed structure.

Others have proposed solutions, including:

Basile US Patent No. 3,878,918;

Husted US Patent No. 2,555,036.

These do not solve the problem as they are ladder-type constructions that have to be manually locked or unlocked, and generally are not useable on four footed structures.

The proposed solution by Robinson, Australian Patent No. AU-A-23711/97 is another ladder type construction. The locking mechanism releases if one leg is lifted off the ground, and further it is unsatisfactory for a four footed structure.

Further proposed solutions of ladder type constructs are by:

Hopfeld US Patent No. 3,102,606;

Cook, Sr. US Patent No. 4,128,139;

Studer US Patent No. 4,627,516.

These also fall short of the desired solution, as they are ladder types, and because their locking systems are incremental in nature they will always have a slight degree of wobble if applied to a four footed structure.

The last solution considered here is a proposed improvement to a four legged table, by Hickman, Australian Patent No. AU-A-24881/95. His proposed solution involves two identical leg assemblies that rotate in opposite directions. While this is another fine proposal in theory, it is evidently impractical in real applications.

The new self-stabilising system explained in this document proposes a solution that is effective in all aspects of operation in four footed structures. This new invention is a built in, self-stabilising system that allows automatic adjustment and locking, ensuring all four feet are firmly maintained on the surface. The advantages and benefits of the self-stabilising system are evident in the unique action of the trigger foot and the adjustable foot. The adjustable foot, once locked into position, will remain locked providing that either the adjustable foot or the trigger foot remain weighted. This enables the self-stabilising system to behave the same as a rigid four footed structure even if the table is tilted. This feature also makes the self-stabilising system suitable for ladders ensuring that the system stays locked even if weight is removed from either of the two feet. It has been effectively demonstrated that the self-stabilising system solves the problem of wobble in four footed structures. The proto-types operate well in providing table stability, ease of use, and effectiveness. Additional benefits, features and aspects of this invention are further described in this document.

Objectives

The objectives of this invention are as follows:

1. to establish a unique self-stabilising system for four footed structures that will adapt itself to even or uneven surface contours;
2. to provide a system of self-stabilisation utilising a completely new technique consisting of a trigger foot, an adjustable foot, and a locking mechanism whereby the trigger foot initiates the locking action upon the adjustable foot;
3. to provide a self-stabilising system applicable to numerous four footed devices of variable size, shape, dimension and function;
4. to provide a means whereby the locking mechanism can be adapted to, and concealed within, a wide variety of conventional support apparatus;
5. to provide a self-stabilising system where the trigger foot and the adjustable foot can have two different methods of operation: telescopic or pivoting;
6. to provide two types of locking aperture mechanisms that can be applied to different needs and styles of manufacturing: the binding arm with aperture and the trigger foot with aperture;
7. to provide a self-stabilising system that can be constructed as an internal mechanism or an external mechanism;
8. to provide a self-stabilising system that can be applied to a support structure in which the trigger leg, adjustable leg, and two fixed legs are elongated;
9. to provide a self-stabilising system in which there are feet that adjust the structure and which exist within the support structure at the point of contact with the support surface;
10. to provide a self-stabilising system that produces an effectively rigid four footed structure;
11. to provide a self-stabilising system that locks the adjustable foot in precise position relative to the exact degree of adjustment required;
12. to provide a trestle stabilising system that is robust and easy to manufacture;
13. to provide a self-stabilising system that offers numerous alternatives and methods of manufacture;
14. to provide the public with a greater choice of alternatives to meet various needs, both household and commercial;
15. to provide a self-stabilising system that may also be applied to two footed structures;
16. to provide a self-stabilising system with greater performance than the previous adjustable levelling devises;
17. to provide greater safety to the public.

Beyond the numerous applications, which is a tremendous feature, the present invention has other benefits. It is exceptionally easy to use, with the trigger foot and the adjustable foot operating automatically. For this example we will use a basic café table to illustrate the superior qualities of the trigger foot system. When placed on a surface, the adjustable foot will extend or retract beyond the height

of the fixed feet. and the trigger foot, in contacting the surface. will retract the small amount needed to initiate the locking of the adjustable foot. The mechanism is designed such that the final retraction of the trigger foot equals that of the adjustable foot after locking has been initiated and both fixed feet are already in contact with the surface. The trigger foot always retracts to the same height as the fixed feet. A benefit of this self-stabilising system is that once the feet are locked into position it effectively behaves the same as a rigid four footed structure. A benefit and dynamic aspect of this self-stabilising system is that if the table is bumped, dragged, pushed, or inadvertently moved, the self-stabilising system more often than not automatically adapts itself to any variation of surface contour within the range of the adjustable foot. The only variable being that a slight rocking action may have to be applied for the adjustable foot to release its position and re-adjust.

Previous systems do not have the unique combination of trigger foot, adjustable foot, and a locking mechanism initiated by the trigger foot. This self-stabilising system can be arranged in numerous ways, creating a variety of options and uses. These and other objectives, features, advantages, and benefits of the invention will be more fully evident from the descriptions of the embodiments and the accompanying drawings.

Brief Description of Drawings

With the objectives included, further reference to is made to the accompanying drawings, illustrating the numerous arrangements, combinations and methods of construction and applications of the invention, and including illustrations of preferred embodiments, wherein:

FIG 1A is the basic principle of support arrangement on a four footed structure;
FIG 1B is the basic principle of support arrangement on a four footed structure where two sets of self stabilising systems are utilised;
FIGs 2A & 2B illustrate the self binding principle;
FIGs 3A & 3B illustrate the two self binding positions;
FIGs 4A through 4H are schematic diagrams illustrating the various arrangements of the crank operated binding arm mechanism;
FIGs 5A through 5H are schematic diagrams illustrating additional arrangements of the crank operated binding arm mechanism;
FIGs 6A through 6H are schematic diagrams illustrating the various arrangements of the slot operated binding arm mechanism;
FIG 7A is a sectioned elevation view through the centre and adjustable foot portion of a standard pedestal;
FIG 7B is a plan view of the underside of a standard pedestal;
FIG 7C is a sectioned elevation view through the trigger foot portion of a standard pedestal;
FIG 7D is a perspective view of a bracket utilised in the standard pedestal;
FIG 8A is a sectioned elevation view through the centre and adjustable foot portion of a slim pedestal;

FIG 8B is a plan view of the underside of a slim pedestal;

FIG 8C is a sectioned elevation view through the trigger foot portion of a slim pedestal:

FIG 8D is a sectioned elevation view through the centre and trigger foot portion of a slim pedestal:

FIG 8E illustrates the slotted actuation bar utilised in a slim pedestal;

FIG 9A is a sectioned elevation view through the centre and adjustable foot portion of a elongated footed pedestal;

FIG 9B is a sectioned elevation view through the trigger foot portion of a elongated footed pedestal;

FIG 9C is a plan view of the underside of a elongated legged pedestal;

FIG 10A illustrates the slotted actuation bar utilised in a corner legged table;

FIG 10B is a sectioned elevation view through two legs and cross frame of a corner legged table;

FIG 10C is a perspective view of a corner legged table;

FIG 11A is a perspective view of a folding table;

FIG 11B is a sectioned elevation view through two legs and cross frame of a folding table:

FIG 12A is an elevation view illustrating the lower portion of the legs on one side of a builder's trestle.

FIG 12B is a schematic perspective view of a builder's trestle;

FIG 13A is an elevation view illustrating the system with parallel feet pivots;

FIG 13B is a perspective view of a table with an "inverted T base" utilising the parallel feet pivot system;

FIG 14A is a sectioned elevation view through the centre and adjustable foot portion of a trigger foot with aperture pedestal;

FIG 14B is a plan view of the underside of a trigger foot with aperture pedestal;

FIG 14C is a sectioned elevation view through the trigger foot portion of a trigger foot with aperture;

FIG 14D is a perspective view of a pedestal base table:

FIG 14E through 14H are schematic diagrams illustrating the possible arrangements of the adjustable foot and trigger foot where the foot pivots are at 90 degrees to each other;

Basic Support Principle for Four Footed Structure

FIG 1A is a plan view schematic diagram illustrating the principle arrangement of the supports on a four footed structure. The adjustable foot 1 and the trigger foot 2 are located on the same side of the structure. This applies to all applications of the self-stabilising system in a four footed structure. Foot 3 and foot 4 are both fixed relative to the structure. This system provides stabilisation only.

Basic Support Principle for Two Sets of Self Stabilising Systems

FIG 1B is a plan view schematic diagram illustrating the principle arrangement where two sets of self-stabilising systems are utilised. The locking of adjustable foot 1 is initiated by trigger foot 2, while the locking of adjustable foot 3 is initiated by trigger foot 4. Two sets allow the angle of the structure, relative to the surface it resides upon, to be altered.

Self Binding Principle

FIG 2A & 2B depict the crank-arm version of three basic mechanism arrangements to illustrate the method of friction binding employed to lock the adjustable foot. The binding arm 1 is attached to the structure, not shown, by pivot pin 2. A locking rod 3 connects with the adjustable foot, not shown, and passes through the aperture 4 in the binding arm. The locking rod is free to slide through the aperture, as indicated by arrow 5, when the axis of the aperture and the locking rod are aligned. Retraction of the trigger foot, not shown, causes the trigger rod 6 to move in the direction of arrow 7, slightly rotating the binding arm about pin 2. This causes the axis of the aperture to become non-aligned with the axis of the locking rod and creates the binding action required to prevent movement of the locking rod in direction of arrow 8.

Binding on Extension & Binding on Retraction

FIG 3A & 3B depict the actuation bar version of three basic mechanism arrangements to illustrate the utilisation of the two binding positions of the binding arm. The binding arm 1 is attached to the structure, not shown, by pin 2. The actuation bar 3 is linked to the trigger foot, not shown, and limited to linear motion by pin 2 passing through the elongated hole 4. Movement of the actuation bar in direction of arrow 5 will cause the binding arm to slightly rotate to one of the binding positions and preventing movement of the locking rod 6 in direction of arrow 7. Movement of the actuation bar in the direction of arrow 8 will prevent movement of the locking rod in direction of arrow 9. These two binding positions can be utilised to provide binding on extension as well as binding on retraction of the adjustable foot.

Crank Actuated Binding Arm Arrangements

FIGs 4A through 4H and FIGs 5A through 5H are schematic diagrams showing various ways the crank actuated binding arm, locking rod, and trigger foot rod can be arranged. The linear and curved arrows indicate the direction the components move in when the structure is being placed. The preferred arrangement for the standard pedestal is that depicted in FIG 4C, however, this patent also claims the rights to all the arrangements detailed.

Slot Actuated Binding Arm Arrangements

FIGs 6A through 6H are schematic diagrams showing various ways the slot actuated binding arm, locking rod, and trigger foot bar can be layed out. The linear and curved arrows indicate the direction the components move in when the structure is being placed. The preferred arrangement for the slim pedestal is that depicted in FIG 6D, however, this patent also claims the rights to all the arrangements detailed.

Standard Pedestal Base

The preferred mechanism for a standard pedestal base utilises a crank operated binding arm of the type depicted in schematic FIG 4C and is here described with reference to FIGs 7A to 7D. FIG 7A is a sectioned elevation showing the pedestal centre and adjustable foot housing. FIG 7B is a plan view of the

underneath side of the pedestal base. FIG 7C is a sectioned elevation of the trigger foot housing. FIG 7D is a three dimensional view of a bracket. The adjustable foot 1 pivots on pin 2 which is located in the pedestal base by the mounting block 3. The locking rod 4 engages with the adjustable foot 1. passes through a hole 18 in a bracket 5, and then through the aperture 6 which is located in the binding arm 8. The adjustable foot 1 is biased to extend by spring 7 which is located on the locking rod 4. The binding arm 8 pivots on bolt 9 which is located in the body of the pedestal base. The trigger foot 10 pivots on pin 11 which is located in the pedestal base by the mounting block 12. The actuation rod 13 engages with the trigger foot 10 and has a reduced diameter at one end for location in the binding arm 8. Spring 14. which is located at one end by a tab 19 on bracket 5 and by the portion of the actuation rod 13 which protrudes through the binding arm 8. biases the binding arm to rotate away from the binding-on-retraction position and to extend the trigger foot 10. Bracket 5 is secured to the pedestal base by the bolt 9 passing through hole 15 and the pedestal post attachment bolt 16 passing through hole 17. Hole 18 is for the locking rod to pass through. The fixed feet have not been shown in either FIG 7A or FIG 7B.

Slim Pedestal Base

The preferred mechanism for a slim pedestal base utilises a binding arm activated by a slotted actuation bar as depicted in schematic FIG 6D and is here described with reference to FIGs 8A to 8E. FIG 8A is a sectioned elevation view through the pedestal base showing detail of the locking mechanism and the adjustable foot. FIG 8B is a plan view showing the underside of the base. FIG 8C & 8D are sectioned elevation views through the trigger foot housing. Figure 8E shows the actuation bar by itself. The adjustable foot 1 is mounted to the structure by the bracket 2 which contains pivot pin 3. The locking rod 4 is attached to the adjustable foot 1 by pin 5 which is welded onto the top of the locking rod 4. The locking rod passes through the aperture 6 located in the binding arm 7. The binding arm pivots on bolt 8 which is located in the body of the pedestal base. A pin 9 is attached to the other end of the binding arm 7 and this pin engages with the angled slot 16 in the actuation bar 10. The actuation bar is located at one end by the binding arm pivot bolt 8 which passes through slot 11. The other end of the actuation bar attaches to the trigger foot 12 by pin 13 which is part of the actuation bar. The trigger foot 12 has one round hole and one slotted hole for pin 13 to reside in. The slotted hole is for assembly reasons only and in operation pin 13 remains at the bottom of the slot. The two springs, one above the adjustable foot and one above the trigger foot, bias the feet to extend when free to do so. The trigger-foot is mounted to the structure by the bracket 14 which has pivot pin 15 welded to it. The fixed feet have not been shown in either FIG 8A or FIG 8B.

Pedestal with Elongated Feet

The preferred mechanism for a pedestal with elongated feet utilises a trigger leg with binding aperture system and is illustrated in FIGs 9A to 9C. With the elongated feet design, the adjustable leg and the trigger leg pivot on pins close to the centre of the pedestal. FIG 9A is a sectioned elevation view

through the centre of the pedestal and the adjustable leg 1. FIG 9B is a sectioned elevation view through the centre of the pedestal and the trigger leg 2. FIG 9C is a plan view of the centre of the pedestal from underneath. Continuing with reference to all these views, the adjustable leg pivots on pin 3 located in the base side flanges 14 of the base. A linkage rod 4 connects between the adjustable leg 1 and the bell-crank 5 by pivots 6 and 7. The bell-crank is attached to the pedestal base 8 by pivot bolt 9. The locking rod 10 is attached to the bell-crank 5 by pin 11 and passes through the aperture piece 12 which is secured to the trigger leg. The trigger leg pivots on pin 13 located in the base side flanges. The adjustable leg is free to move when the axis 14 of the aperture 12, located on the trigger leg, is aligned with the axis of the locking rod. Binding between the trigger leg aperture 12 and the locking rod locks the adjustable leg. This is designed to lock when the trigger leg is at the same angle as the fixed legs relative to the pedestal stem.

Telescopic Legged Table

The preferred mechanism for a four legged table, as depicted in FIG 10C, utilises a binding arm which is actuated by a slotted bar as illustrated in FIGs 10A & 10B. The adjustable foot 1 and the trigger foot 2 both move longitudinally relative to their respective legs 3 and 4. The locking rod 5 is attached to, or part of, the adjustable foot and concealed within the leg 3. A trigger foot rod 6 is attached to, or part of, the trigger foot 2 and concealed within leg 4. The binding arm 7, attached to the frame by pivot 8, contains an aperture for the locking rod 5 to pass through. A pin 10 engages the binding arm with the actuation bar 9 via slot 15. Another pin 13 engages the lever 11 with the actuation bar 9 via slot 14. The lever 11 is attached to the frame by pivot 12 and connects with the trigger foot rod 6. The actuation bar is located in the frame by pivot 8 and pivot 12 passing through the horizontal slots. Movement of the trigger leg rotates lever 11 and in turn causes linear motion of the actuation bar. This linear motion of the actuation bar 9 is then transformed back to rotational motion of the binding arm 7. The rotation of the binding arm is limited by the two binding positions of the locking rod in the aperture, locking on extension and locking on retraction.

Alternatively, the binding arm 7 and the lever 11 could both contain crank arms connected with a linkage rod as utilised in the telescopic folding table example listed below.

Telescopic Folding Table

The preferred mechanism for a telescopic folding table, as depicted in FIG 11A, is illustrated in FIG 11B. The adjustable leg 1 and the trigger leg 2 move longitudinally relative to the structure's legs. The locking rod 3 is attached at the bottom of the adjustable leg and the trigger rod 4 similarly attached to the trigger leg. The binding arm 5 is attached to the frame by pivot 6, and lever 7 is attached to the frame by pivot 8. The binding arm and the lever are connected by linkage rod 9.

Builder's Trestle

The preferred mechanism for a builder's trestle is a telescopic system with an external mechanism as detailed in FIG 12A, which is an elevation view of the lower portion of the trestle showing the self-

locking-system in detail for one set of the trestle's telescopic legs. In this arrangement the adjustable leg 1, shown at near full extension, also acts as the locking rod. The adjustable leg is a stepped tube, the larger upper section being free to slide inside the tube of the trestle frame 2, and the smaller lower section being free to slide through the aperture of the binding arm 3 when their axis are aligned. The larger upper diameter serves to limit the extension of the adjustable leg 1. The binding arm 3 is mounted to the trestle frame by pivot 4 and is connect to lever 5 by linkage rod 6. Lever 5 is mounted to the trestle frame by pivot 7 and engages with the trigger leg 8 by having the end of the lever located through a hole in the side of the trigger leg 8. The trigger-leg is free to slide inside the tube of the trestle frame. When the trestle is placed the adjustable leg 1 retracts until the trigger leg 8 also makes contact with the surface. A small retraction of the trigger leg causes the binding arm 3 to slightly rotate and initiate friction binding of the adjustable leg 1. When lifting the trestle above a surface, a small extension of the trigger leg 8 moves the locking mechanism to the binding on extension position and thus producing a friction locking in the other direction for the adjustable leg 1 and preventing it from dropping down.

The system may be applied to one or two sets of the trestle's legs. Applied to one set of legs provides stabilisation only, while applied to two sets of legs allows the level of the trestle to be adjusted relative to the surface it is placed upon. In both applications the locking of the adjustable leg is automatic. FIG 12B is a sketch of a trestle showing the position of two sets of self locking systems. The lower ends of all four legs are telescopic. Leg 9 triggers the locking of adjustable leg 10, while leg 11 triggers the locking of adjustable leg 12.

Parallel feet pivots with Trigger Foot Aperture

This version of the self stabilising system has the locking aperture and trigger foot combined, and the adjustable foot pivot is parallel with the trigger foot pivot. It has a wide range of applications, but for ease of description, the 'inverted-T-style' table base, FIGs 13A & 13B, is utilised to illustrate the mechanism arrangement. The adjustable foot 1 is attached to the structure by pivot 2. The locking rod 3, connected to the adjustable foot by pivot 4, passes through the locking aperture 5 in the trigger foot 6. The trigger foot is attached to the structure by pivot 7. Gravity or springs 8 and 9 may be utilised to bias both the adjustable foot and the trigger foot to extend when free to do so. Free from a surface the trigger extends until the locking mechanism is in the binding on extension position. When being placed upon a surface the trigger foot 6 retracts until the locking mechanism moves to the binding on retraction position. Between these two locking positions the locking rod 3 is free to pass through the aperture 5, permitting the adjustable foot 1 to extend if necessary. The adjustable foot can extend much further than the trigger foot, the latter's rotation being limited to a relatively small amount by the clearance between the locking rod and the aperture.

The same mechanism layout, but placed in a different structure, may be applied for stabilising various structures or appliances such as washing machines and refrigerators.

Trigger Foot Aperture with Feet Pivots at 90 Degrees

The preferred mechanism for a pedestal base with trigger foot aperture is detailed with reference to FIGs 14A to 14C. This arrangement utilises the configuration of trigger foot and adjustable foot as depicted in FIG 14E. FIG 14A is a sectioned elevation showing the pedestal centre and adjustable foot housing. FIG 14B is a plan view of the underneath side of the pedestal base. FIG 14C is a sectioned elevation of the trigger foot housing. The adjustable foot 1 pivots on pin 2 which is located in the pedestal base by the mounting block 3. The linkage rod 4 connects the adjustable foot with the bell-crank 5 located near the centre of the pedestal base by pivot bolt 6. The locking rod 7 connects to the bell-crank 5 and passes through the locking aperture 8 which is part of the trigger foot 9. The trigger-foot is mounted to the structure by the bracket 10 which has pivot pin 11 welded to it. Two springs, one above the adjustable foot and one above the trigger foot, bias the feet to extend when free to do so. The fixed feet have not been shown in any of these figures. FIGs 14F through 14H are alternative ways in which the trigger foot and adjustable foot can be arranged and are claimed by this invention.

Scope of Invention

The scope of this invention applies generally to all types of embodiments which could be devised and operable as or within any four-footed structure employing the self stabilising system. including but not limited to:

tables and benches;

washing machines and dryers;

refrigerators and freezers;

trestles and scaffolding;

filing cabinets and floor cabinets;

ladders and any indoor or outdoor apparatus.

Summary

This invention provides an alternative and an improvement to known systems and methods for self-stabilising tables, trestles, and any four footed structure employing this self-stabilising system. The invention exists as a stabilising assembly and when placed on any surface, even or uneven, it is self-adjusting and self-stabilising. It can be built into a plurality of supports, meaning two out of four legs/feet in a typical table, or most four legged structures. In a four footed structure, it has two fixed feet, an adjustable foot. and a trigger foot. Its uniqueness is a result of the principle of its action. consisting of an adjustable foot. a means of locking the adjustable foot, and a trigger foot that initiates the locking action upon the adjustable foot.

The locking action, in general, occurs when the axis of the locking rod and the axis of the aperture arm become non-parallel to each other, creating a friction-binding action.

In operation. the four-footed structure settles onto the two fixed feet first and then the adjustable foot will extend or retract beyond the height of the fixed feet. and the trigger foot, in contacting the surface, will retract the small amount needed to initiate the locking of the adjustable foot. The mechanism is designed such that the final retraction of the trigger foot equals that of the adjustable foot after locking has been initiated and both fixed feet are already in contact with the surface. The trigger foot always retracts to the same height as the fixed feet. A benefit of this self-stabilising system is that once the feet are locked into position it effectively behaves the same as a rigid four footed structure. .

In addition, to summarise in greater detail, the ratio of leverage on the locking mechanism by the adjustable foot in relation to that of the trigger foot, is designed such that the final retraction of the adjustable foot equals that of the trigger foot, beginning when the locking action commences and the structure (table) is being secured in place, with the two fixed feet already firmly in contact with the surface. This is further clarified in the description section of this document.

The claims defining the invention are as follows:

Claim 1. A self stabilising system, as an assembly operating within or as any four footed structure, consisting of an adjustable foot, a means of locking the adjustable foot, and a trigger foot that initiates the locking action of the adjustable foot, and where both the adjustable foot and the trigger foot are existing on one side of the four footed structure, and where the two fixed feet are existing on the other side of the four footed structure, and further, the ratio of leverage on the locking mechanism by the adjustable foot in relation to the trigger foot, is designed such that the final retraction of the adjustable foot equals that of the trigger foot, beginning when the locking action commences and the structure (table, for example) is being secured in place, with the two fixed feet already firmly in contact with the surface, thereby when placed on a surface, the adjustable foot will extend or retract beyond the height of the fixed feet, and the trigger foot, in contacting the surface, will retract the small amount needed to initiate the locking of the adjustable foot, and further, the trigger foot always retracts to the same height as the fixed feet;

Claim 2. A self stabilising system according to claim 1, wherein a binding arm with aperture is the differentiating component that in connection with the locking rod forms the locking mechanism of said self stabilising system;

Claim 3. A self stabilising system according to claim 1, wherein a trigger foot with aperture is the differentiating component that in connection with the locking rod forms the locking mechanism of said self stabilising system;

Claim 4. A self stabilising system according to claims 1 and 2, wherein a pivoting action of the adjustable foot and the trigger foot are at 90 degrees to each other is the differentiating component;

Claim 5. A self stabilising system according to claims 1 and 2, wherein a telescopic action of the adjustable foot and the trigger foot is the differentiating component;

Claim 6. A self stabilising system according to claims 1, 2, and 4, wherein an internal binding arm and feet are the differentiating components;

Claim 7. A self stabilising system according to claims 1, 2, and 4, wherein an external binding arm and feet are the differentiating components;

Claim 8. A self stabilising system according to claims 1, 2, and 5, wherein an internal binding arm and feet are the differentiating components;

Claim 9. A self stabilising system according to claims 1, 2, and 5, wherein an external binding arm is the differentiating component;

Claim 10. A self stabilising system according to claims 1, 2, 4, and 6, wherein a slot-activated binding arm in a slim pedestal base is the differentiating component;

Claim 11. A self stabilising system according to claims 1, 2, 4, and 6, wherein a crank-activated binding arm in a standard pedestal base is the differentiating component;

Claim 12. A self stabilising system according to claims 1, 2, 4, and 7, wherein a slot-activated binding arm, an elongated external trigger foot, an elongated external adjustable foot, and two elongated fixed feet are the differentiating components;

Claim 13. A self stabilising system according to claims 1, 2, 4, and 7, wherein a crank-activated binding arm, an elongated external trigger foot, an elongated external adjustable foot, and two elongated fixed feet are the differentiating components;

Claim 14. A self stabilising system according to claims 1, 2, 5, and 8, wherein a slot-activated binding arm in a corner legged table is the differentiating component;

Claim 15. A self stabilising system according to claims 1, 2, 5, and 8, wherein a crank-activated binding arm in a corner legged table is the differentiating component;

Claim 16. A self stabilising system according to claims 1, 2, 5, and 8, wherein a slot-activated binding arm in a folding table is the differentiating component;

Claim 17. A self stabilising system according to claims 1, 2, 5, and 8, wherein a crank-activated binding arm in a folding table is the differentiating component;

Claim 18. A self stabilising system according to claims 1, 2, 5, and 9, wherein an external crank-activated binding arm in a builder's trestle is the differentiating component;

Claim 19. A self stabilising system according to claims 1 and 3, wherein the trigger foot pivot, parallel with the adjustable foot pivot, is the differentiating component;

Claim 20. A self stabilising system according to claims 1 and 3, wherein a pivoting action of the adjustable foot and the trigger foot are at 90 degrees to each other is the differentiating component;

Claim 21. A self stabilising system according to claims 1, 3, and 19, wherein the trigger foot with aperture and the adjustable foot are internal is the differentiating component;

Claim 22. A self stabilising system according to claims 1, 3, and 20, wherein the trigger foot with aperture and the adjustable foot are internal is the differentiating component;

Claim 23. A self stabilising system according to claims 1, 3, and 20. wherein the elongated external trigger foot, an elongated external adjustable foot, and two elongated external fixed feet is the differentiating component;

Claim 24. As in claims 1 through 23. substantially as herein described with reference to any one of the embodiments of the invention, all possible variations of locking mechanism's actions shown in the accompanying drawings as in figures 4A through 4H, figures 5A through 5H, figures 6A through 6H, and figures 14E through 14H.

AMENDED CLAIMS

[received by the International Bureau on 19 July 2000 (19.07.00) ;
original claims 1-24 replaced by new claims 1-6 (1 pages)]

The claims defining the invention are as follows:

Claim 1. A self stabilising system, as an assembly operating within or as any four footed structure, consisting of an adjustable foot, a means of locking the adjustable foot, and a trigger foot that initiates the locking action of the adjustable foot, and where both the adjustable foot and the trigger foot are existing on one side of the four footed structure, and where the two fixed feet are existing on the other side of the four footed structure, and further, the ratio of leverage on the locking mechanism by the adjustable foot in relation to the trigger foot, is designed such that the final retraction of the adjustable foot equals that of the trigger foot, beginning when the locking action commences and the structure (table, for example) is being secured in place, with the two fixed feet already firmly in contact with the surface, thereby when placed on a surface, the adjustable foot will extend or retract beyond the height of the fixed feet, and the trigger foot, in contacting the surface, will retract the small amount needed to initiate the locking of the adjustable foot, and further, the trigger foot always retracts to the same height as the fixed feet;

Claim 2. A self stabilising system according to claim 1, wherein a pivoting adjustable foot with a locking rod (of circular, rectangular, or some other cross-sectional shape) connected to it, the locking of the adjustable foot achieved by friction binding of the locking rod in an aperture contained in a pivoting binding piece, and this binding piece being connected to a pivoting trigger foot being the differentiating components.

Claim 3. A self stabilising system according to claim 1, wherein a pivoting adjustable foot with a locking rod (of circular, rectangular, or some other cross-sectional shape) connected to it, and the locking of the adjustable foot achieved by friction binding of the locking rod in an aperture contained in a pivoting trigger foot being the differentiating components.

Claim 4. A self stabilising system according to claim 1, wherein a telescopic adjustable foot and the locking rod (of circular, rectangular, or some other cross-sectional shape) being either a part of the adjustable foot or the adjustable foot itself, the locking of the adjustable foot achieved by friction binding of the locking rod in an aperture contained in a pivoting binding piece, and this binding piece being connected to a telescopic trigger foot being the differentiating components.

Claim 5. A self stabilising system according to claim 1, wherein a telescopic adjustable foot and the locking rod (of circular, rectangular, or some other cross-sectional shape) being either a part of the adjustable foot or the adjustable foot itself, the locking of the adjustable foot achieved by friction binding of the locking rod in an aperture contained in a pivoting binding piece, and this binding piece being connected to a pivoting trigger foot being the differentiating components.

Claim 6. As in claims 1 through 5, substantially as herein described with reference to any one of the embodiments of the invention, all possible variations of locking mechanism's actions shown in the accompanying drawings as in figures2A and 3A, figures 4A through 4H, figures 5A through 5H, figures 6A through 6H, and figures 14E through 14H.

FIG 1A

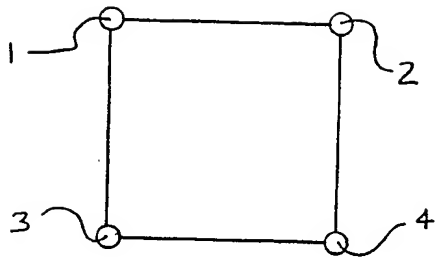


FIG 1B

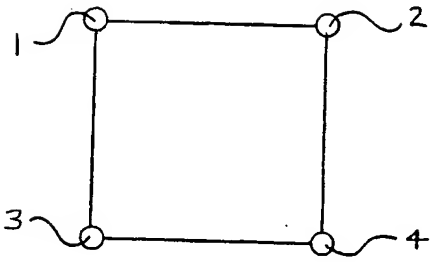


FIG 2A

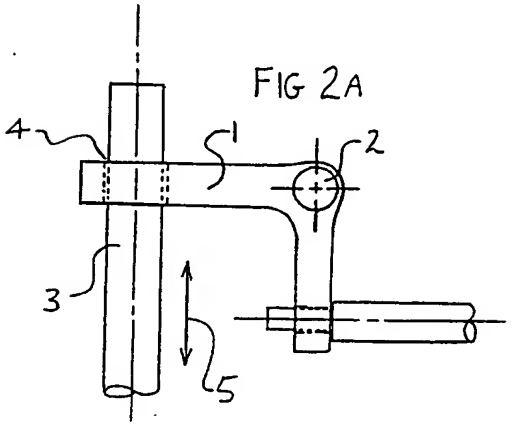


FIG 2B

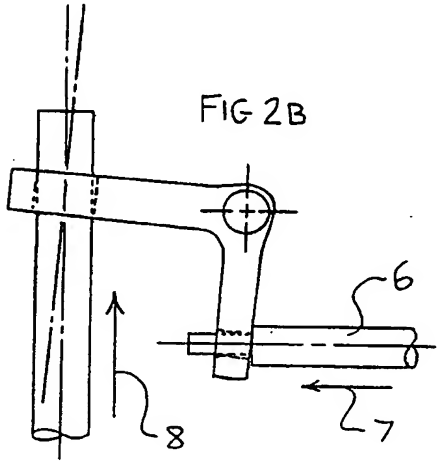


FIG 3A

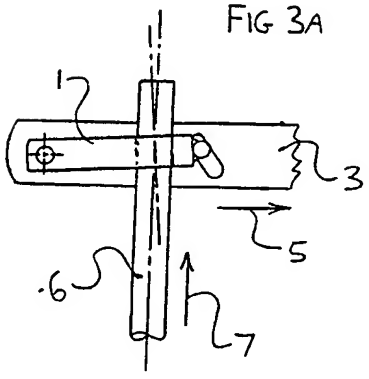
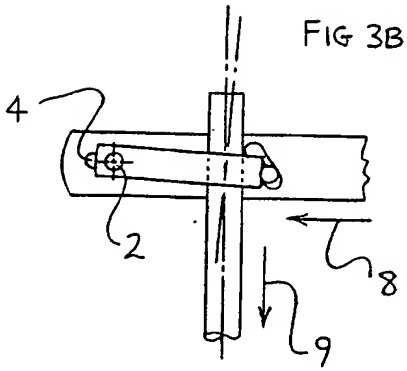


FIG 3B



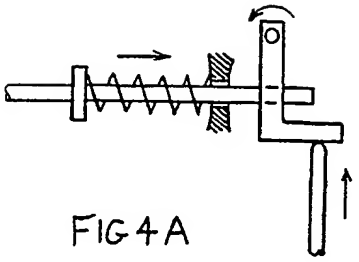


FIG 4A

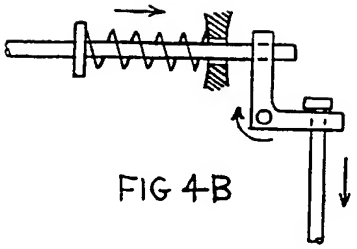


FIG 4B

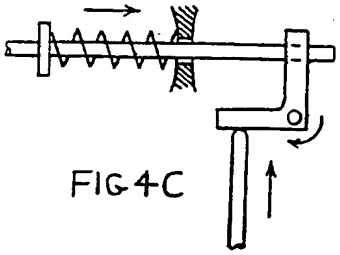


FIG 4C

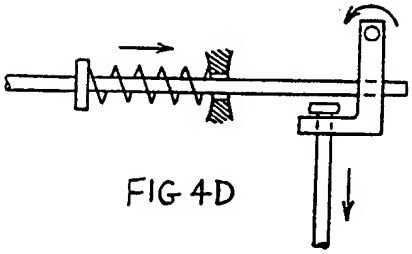


FIG 4D

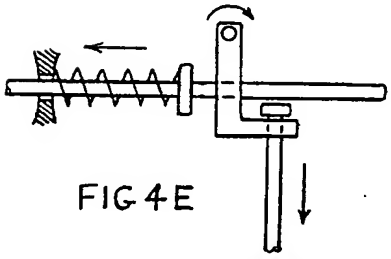


FIG 4E

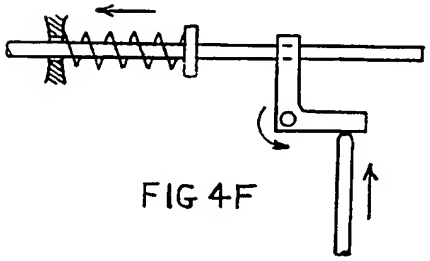


FIG 4F

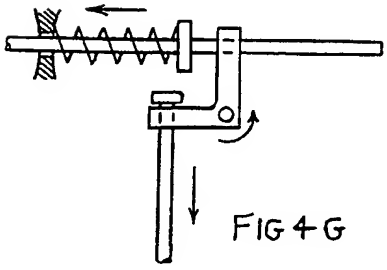


FIG 4G

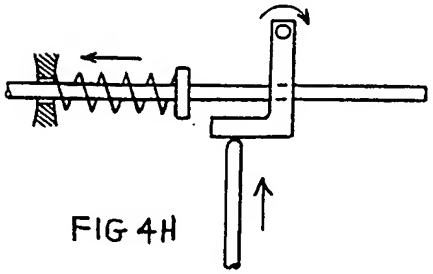


FIG 4H

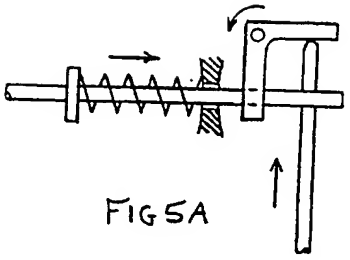


FIG 5A

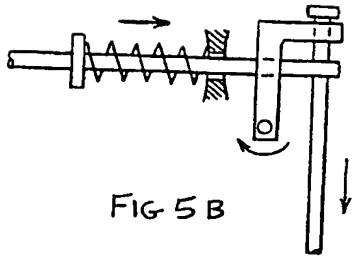


FIG 5B

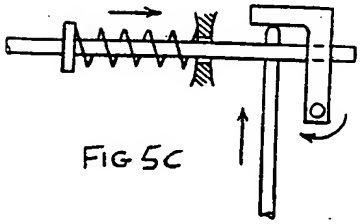


FIG 5C

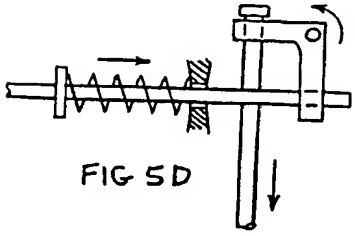


FIG 5D

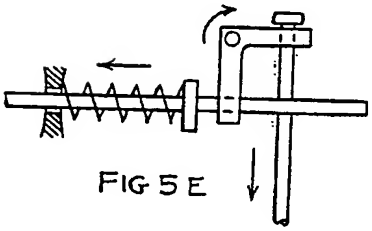


FIG 5E

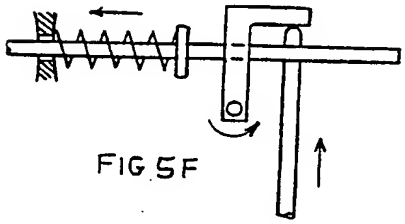


FIG 5F

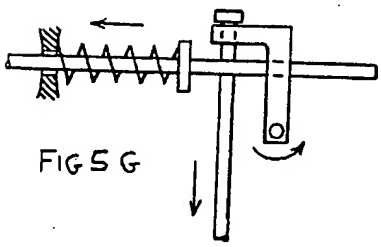


FIG 5G

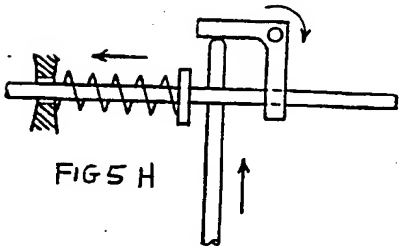


FIG 5H

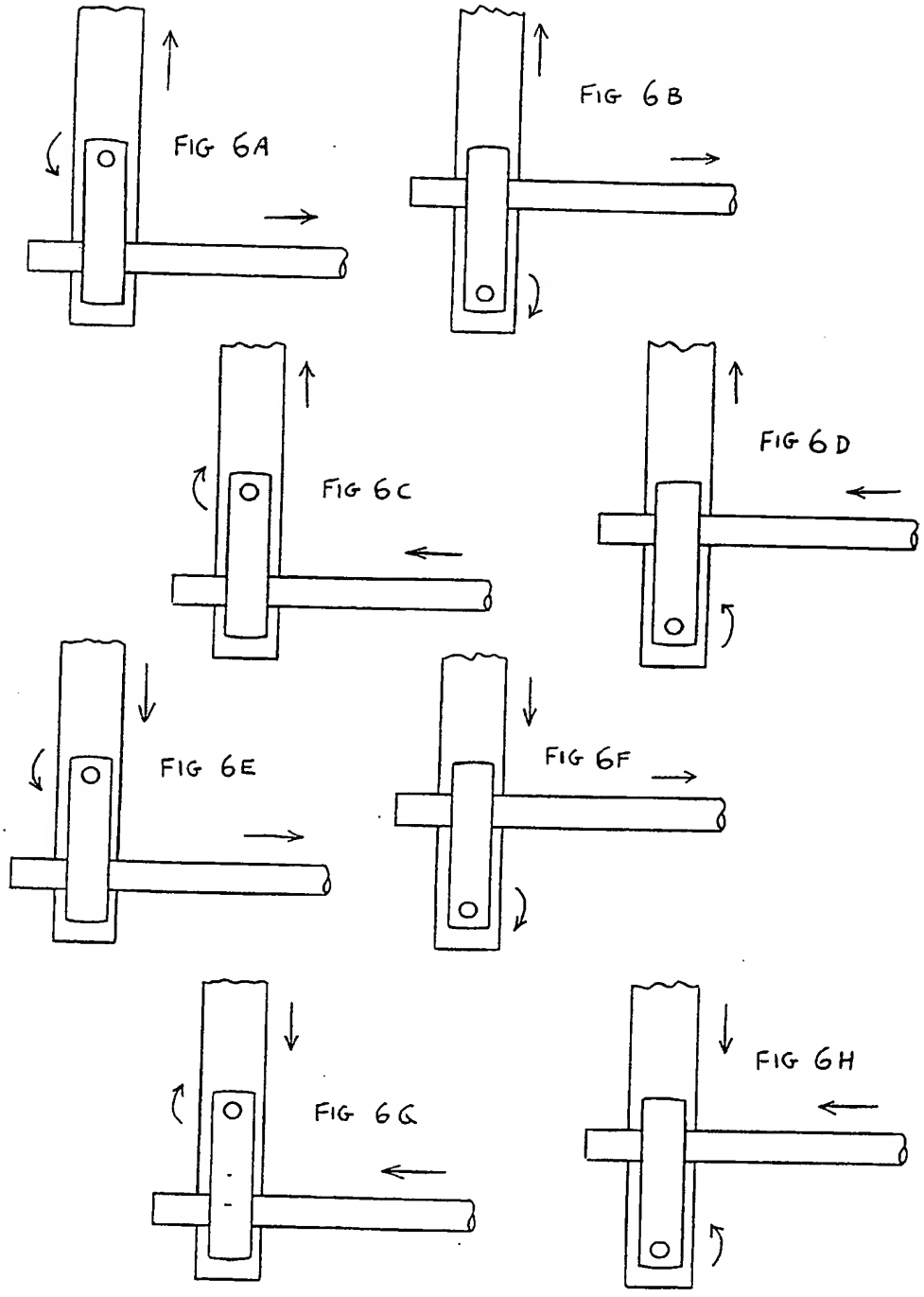


FIG 6A
FIG 6B
FIG 6C
FIG 6D
FIG 6E
FIG 6F
FIG 6G
FIG 6H

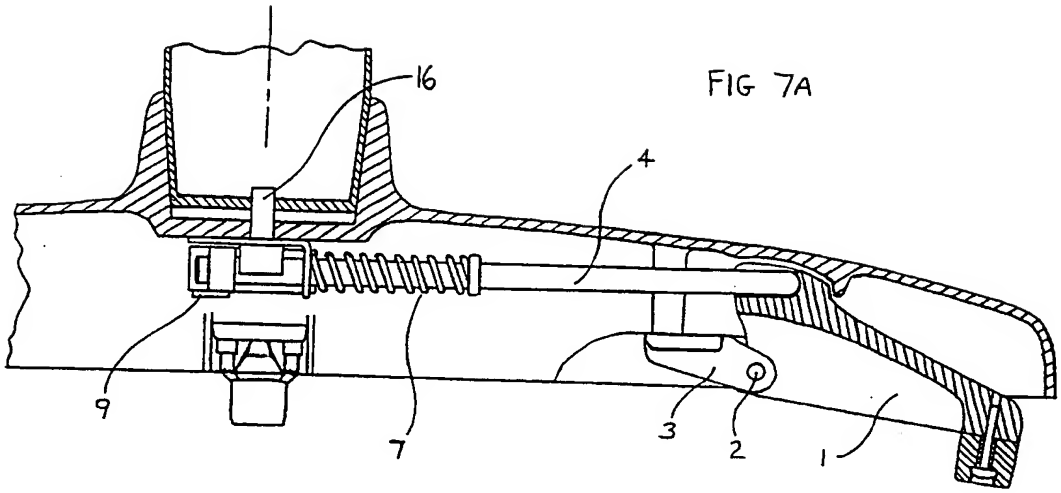


FIG 7A

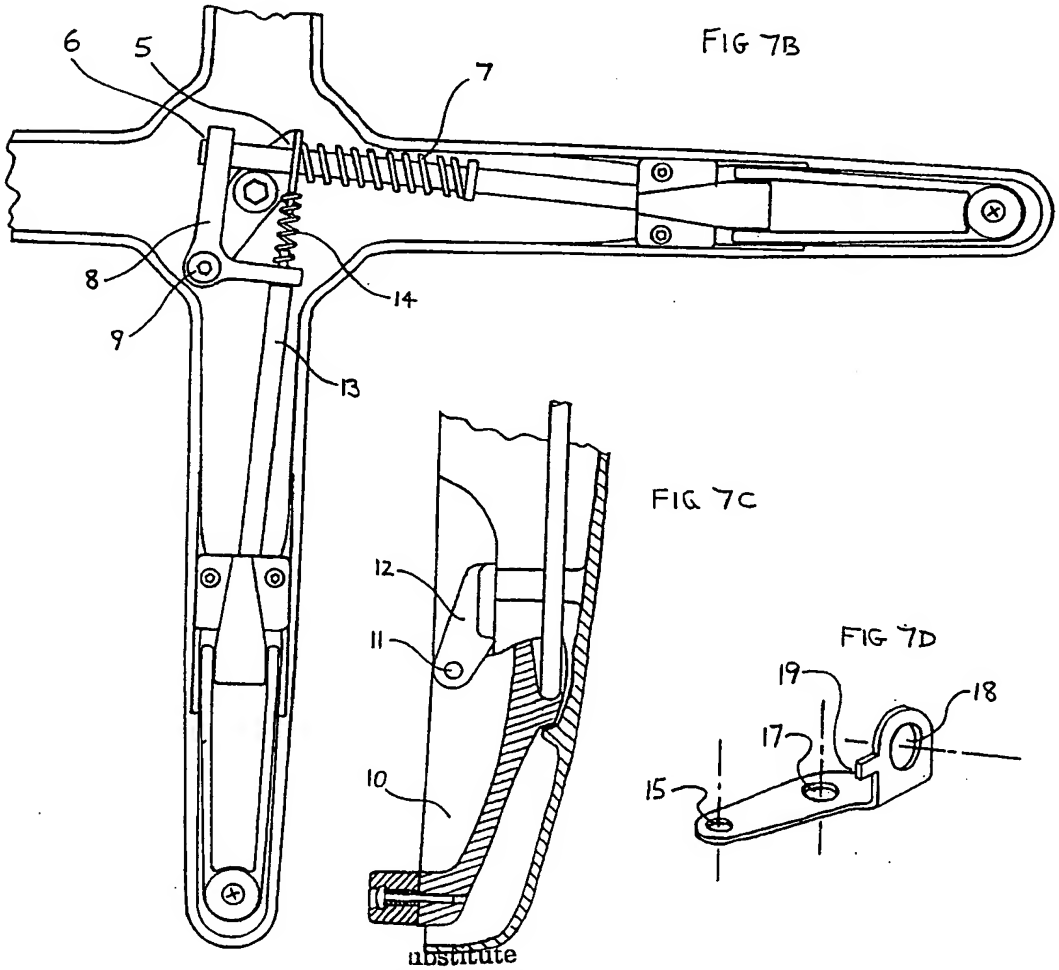


FIG 7B

FIG 7C

FIG 7D

FIG 8A

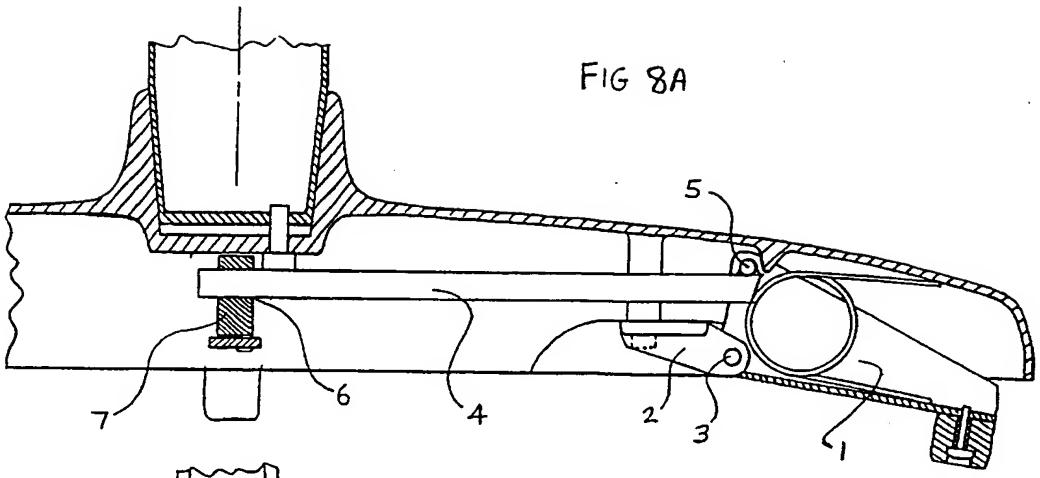


FIG 8B

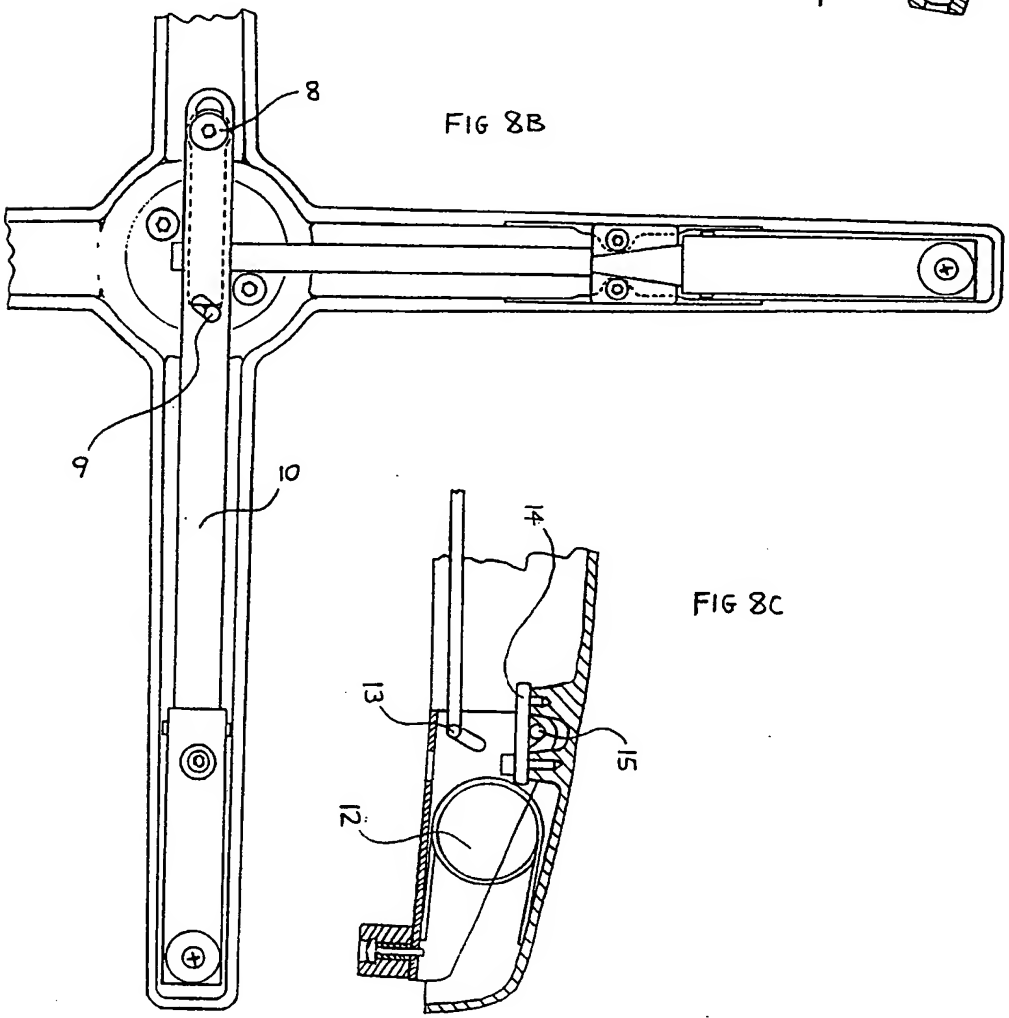


FIG 8C

FIG 8D

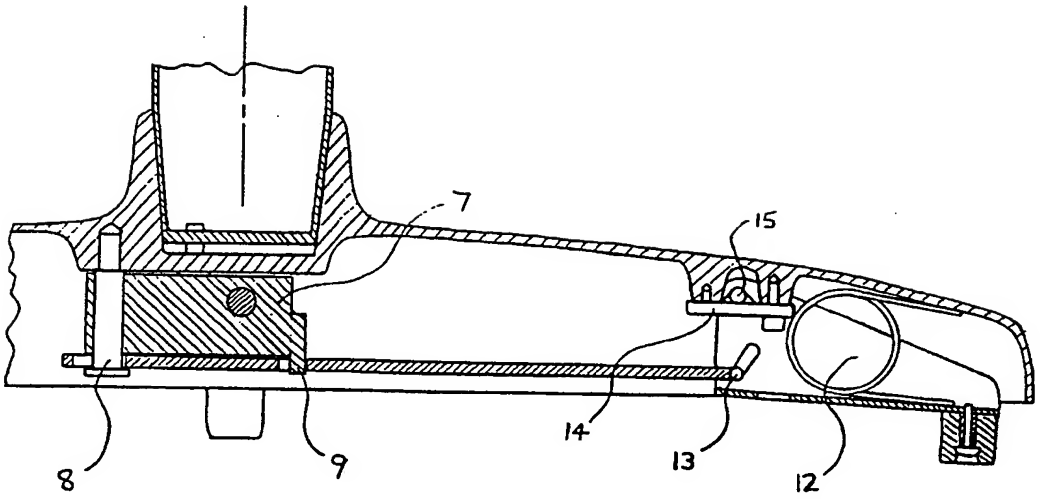
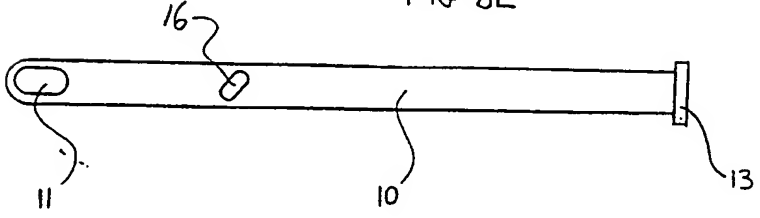


FIG 8E



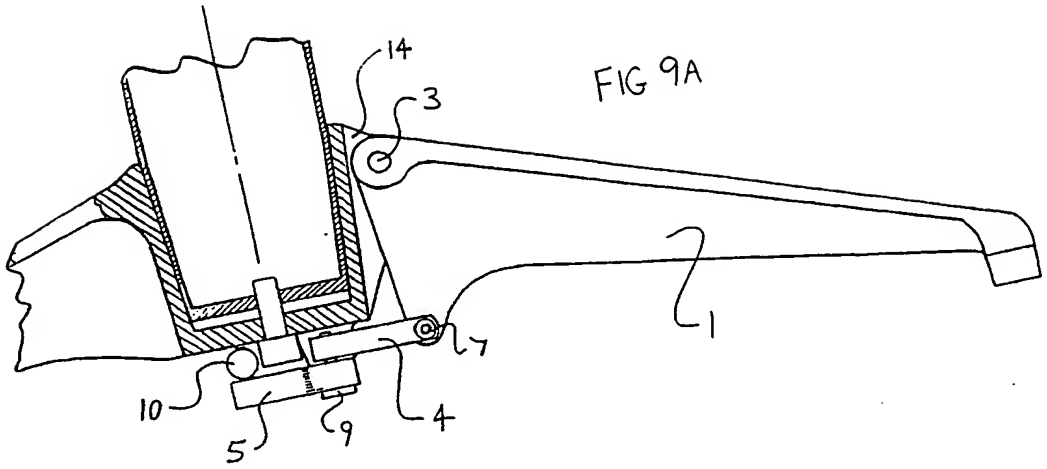


FIG 9A

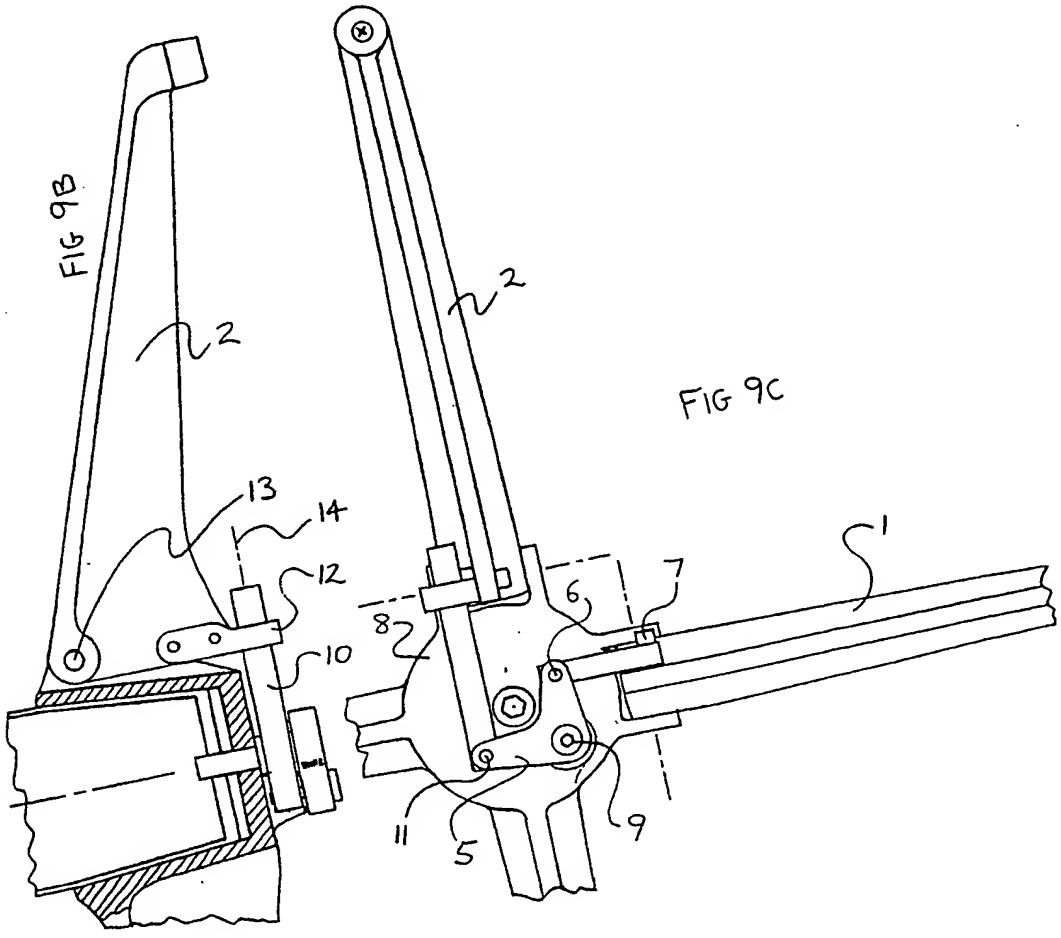


FIG 9B

FIG 9C

FIG 10A

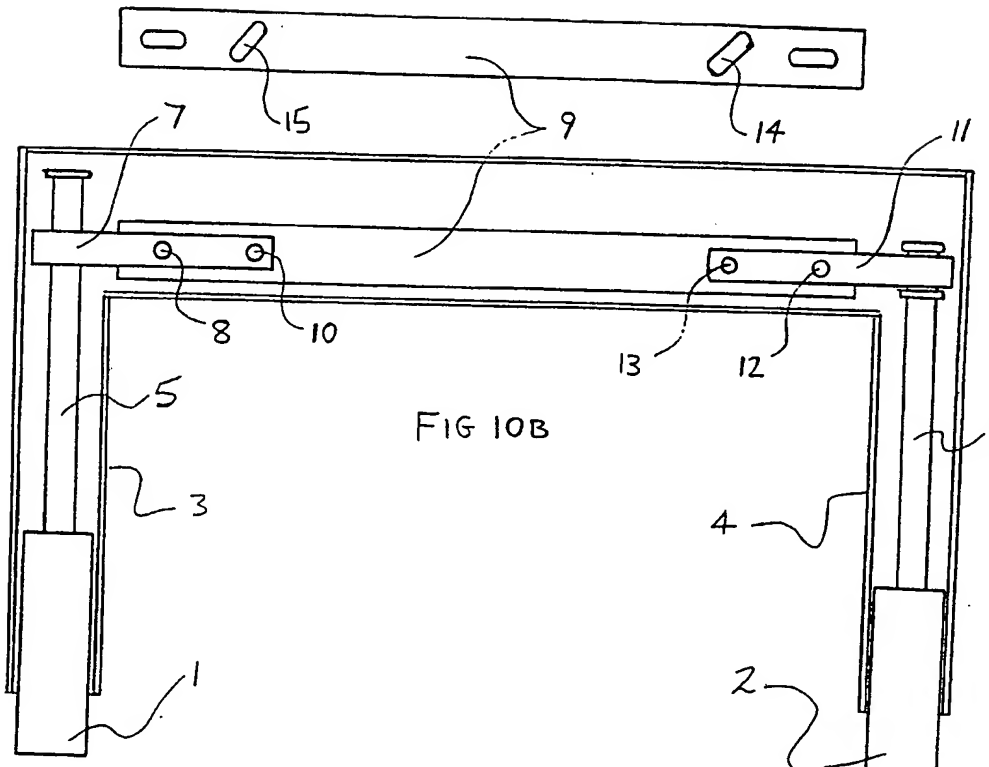


FIG 10B

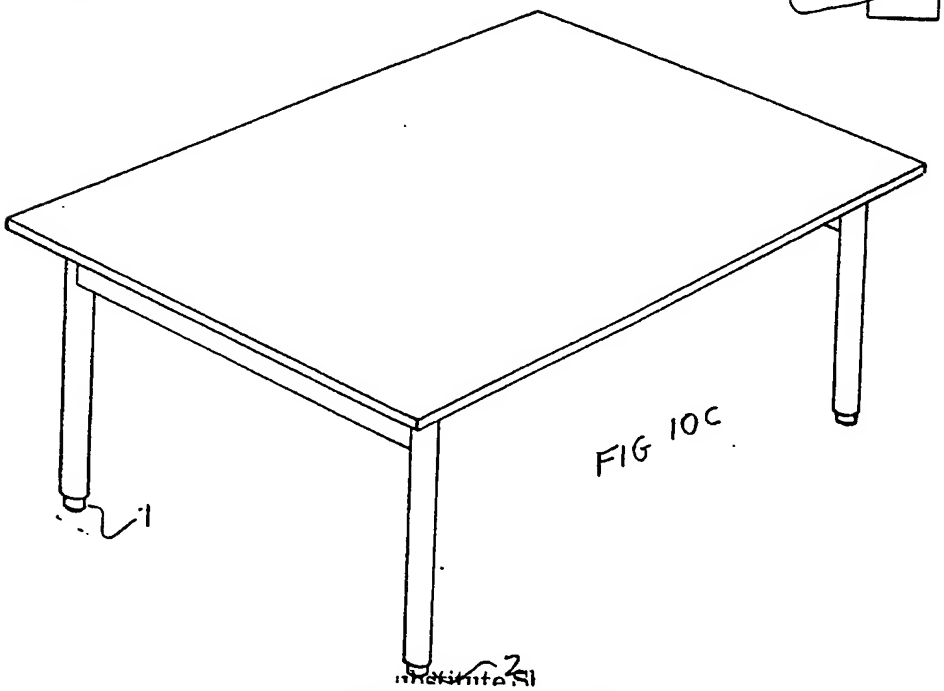
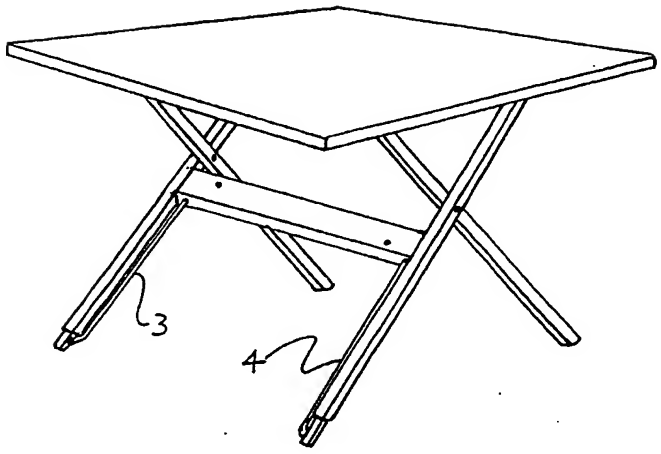


FIG 10C

FIG 11A



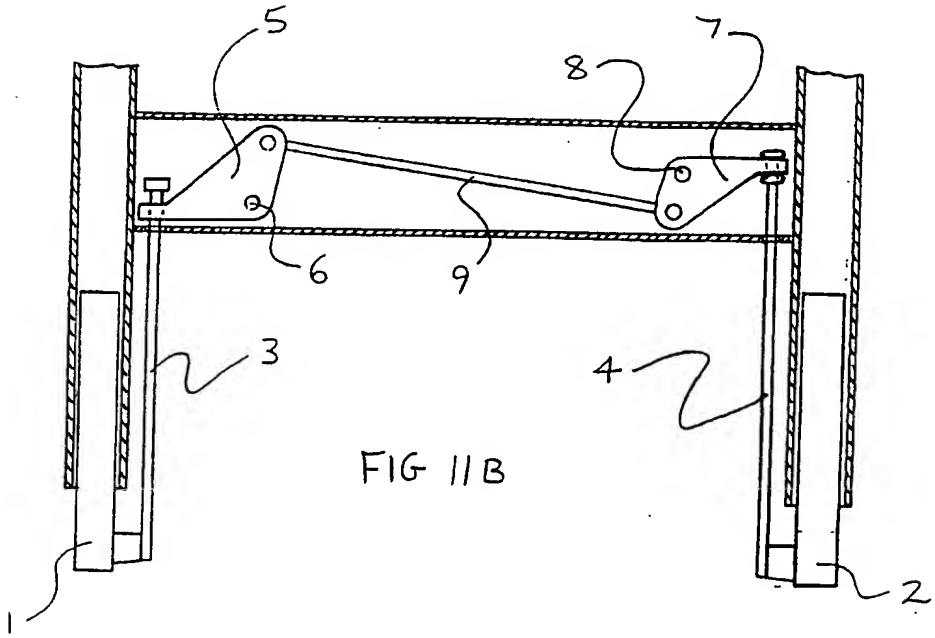
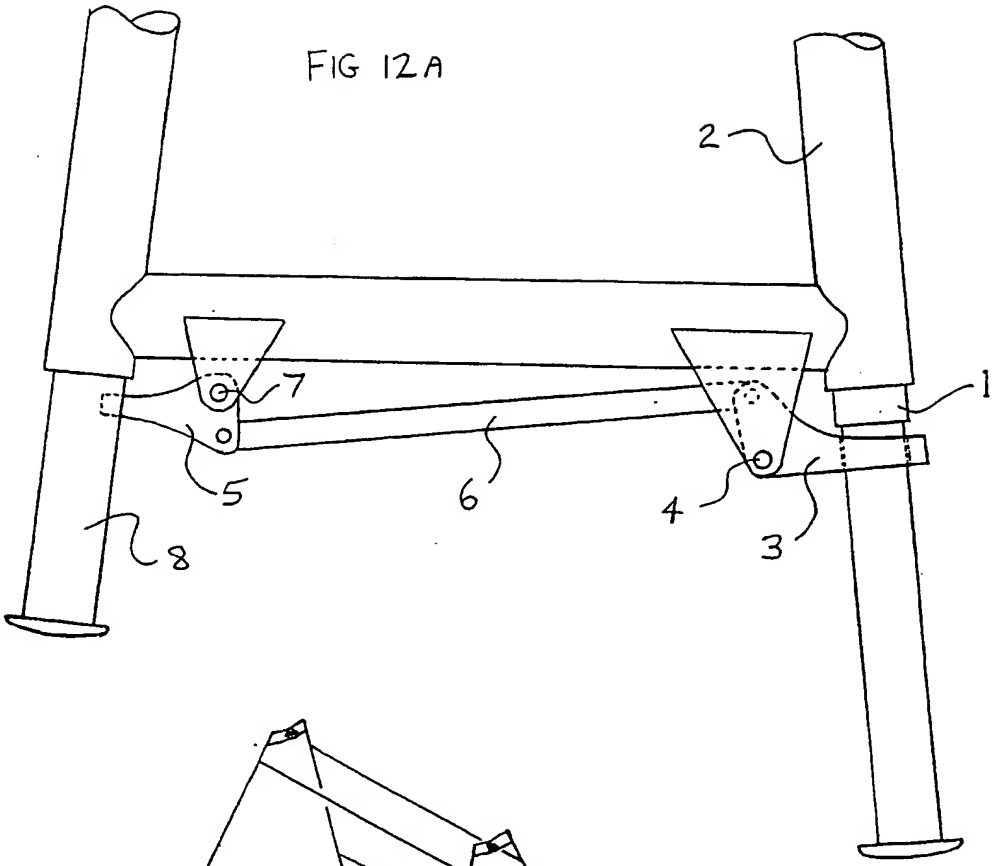


FIG 11B

FIG 12A



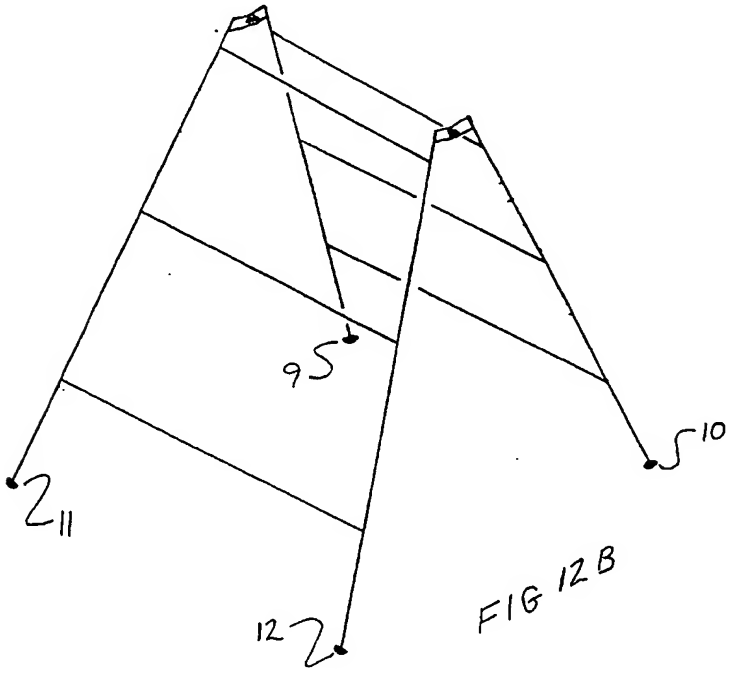


FIG 12B

FIG 13A

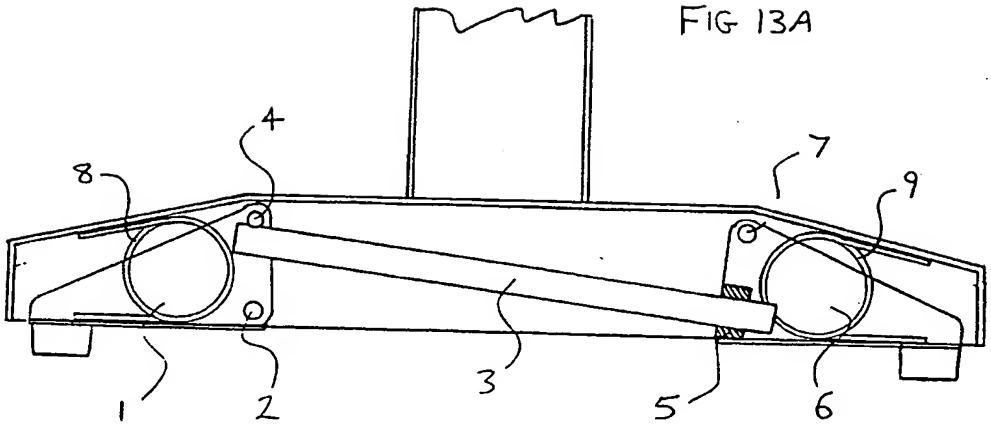


FIG 13B

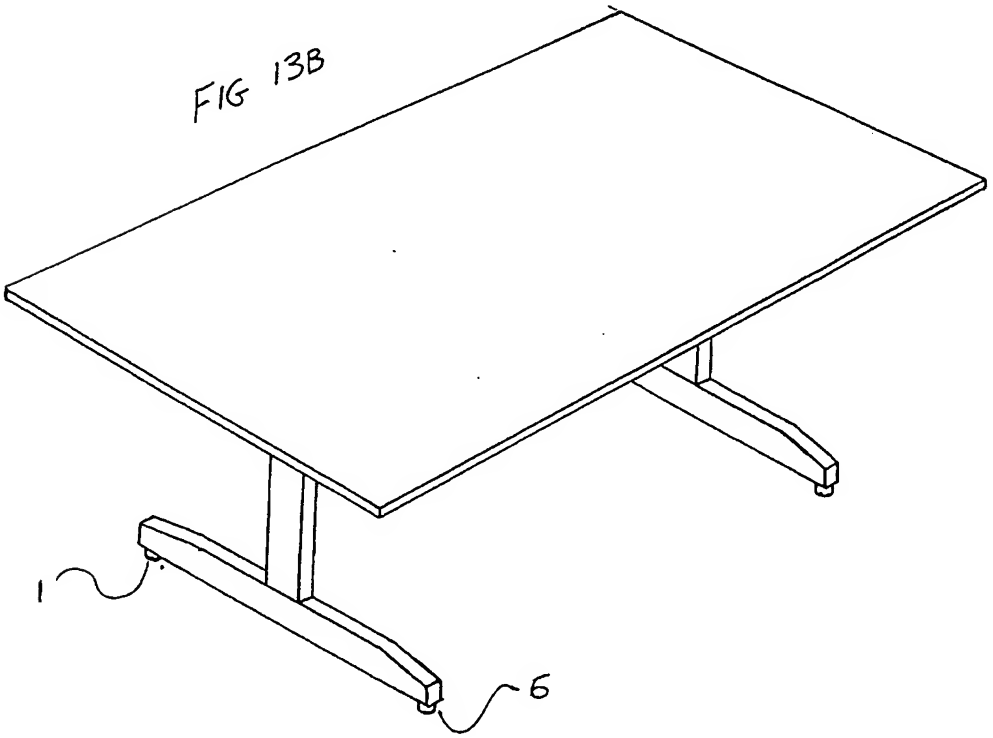


FIG 14A

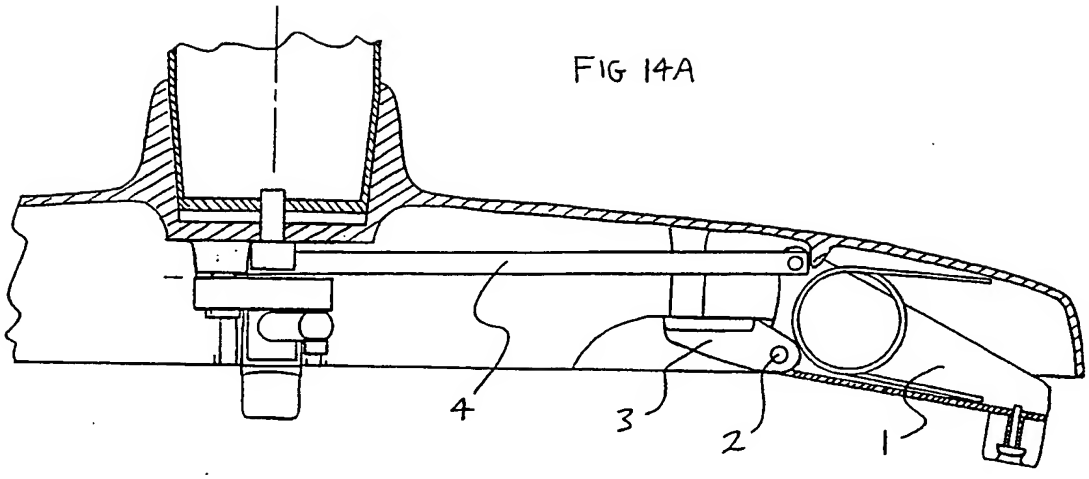


FIG 14B

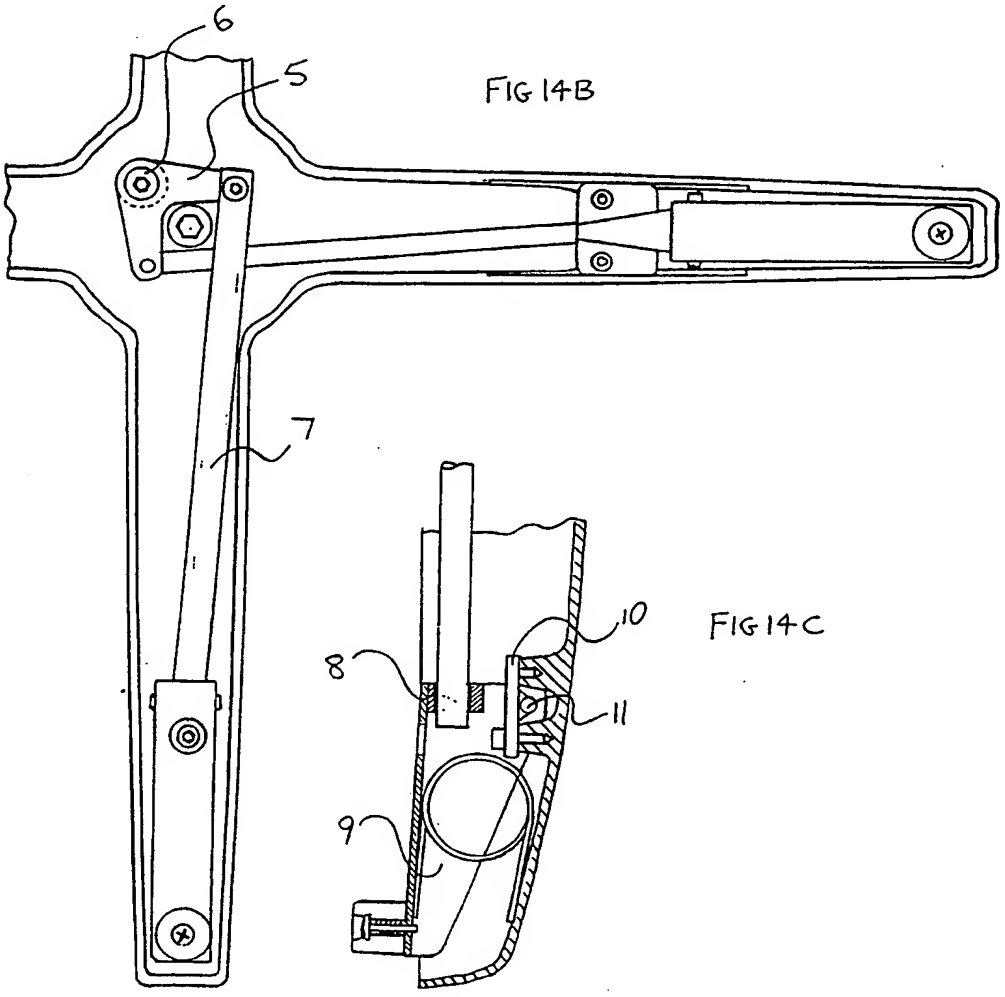


FIG 14C

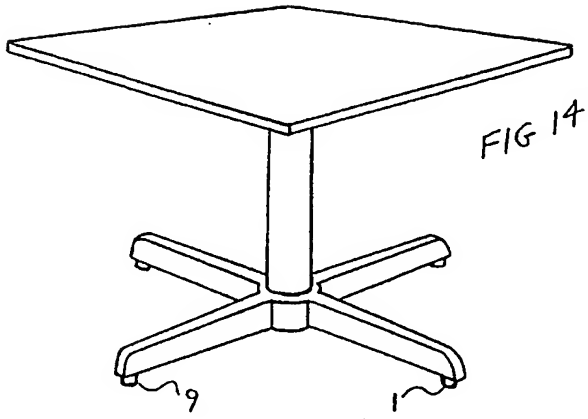


FIG 14D

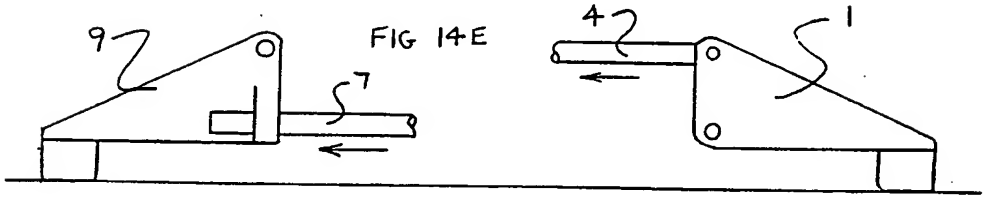


FIG 14E

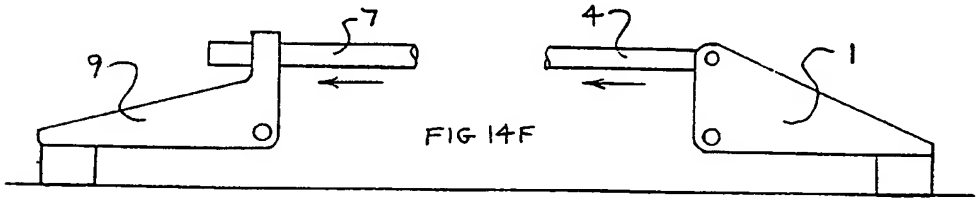


FIG 14F

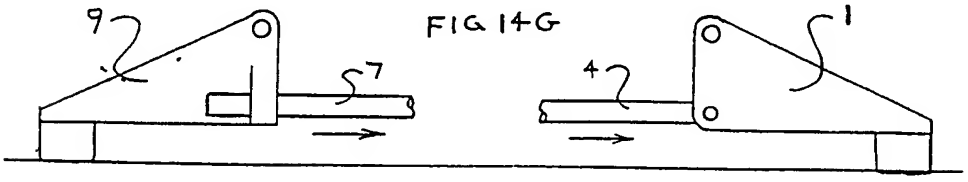


FIG 14G

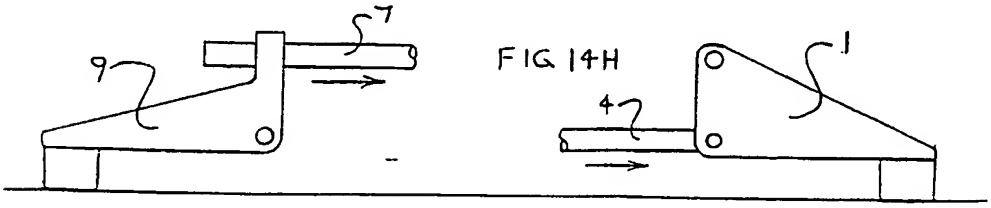


FIG 14H

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU 00/00273

A. CLASSIFICATION OF SUBJECT MATTER

Int Cl[7]: A47B 91/02, 91/16; E06C 7/44; F16M 11/24, 11/26

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC: A47B 91/02, 91/16; E06C 7/44; F16M 11/24, 11/26

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
AU: IPC as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	AU 23711/97 A (PANORAMA QUEST PTY LTD) 20 August 1998 pages 5-7, figure 2	
A	US 4627516 A (STUDER) 9 December 1986 column 4, line 28-column 5, line 21, figures 3, 4	
A	US 4128139 A (COOK, Sr) 5 December 1978 columns 2-4, figure 2	

[X] Further documents are listed in the continuation of Box C

[X] See patent family annex

* Special categories of cited documents:

"A" Document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
25 May 2000	20 JUN 2000
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200 WODEN ACT 2606 AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No.: (02) 6285 3929	Authorized officer D.G. FRY Telephone No.: (02) 6283 2130

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU 00/00273

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4095671 A (FORRISTALL et al) 20 June 1978 column 4, lines 7-15, figure 4	
A	US 3878918 A (BASILE) 22 April 1975 column 2, lines 6-18, figure 3	
A	US 3102606 A (HOPFELD) 3 September 1963 column 2, line 39-column 4, line 28, figures 1, 3	
A	US 2890824 A (DERBY et al) 16 June 1959 column 3, lines 21-70, figure 1	
A	US 2835427 A (BALCAR) 20 May 1958 column 2, lines 36-67, figure 1	
A	US 2555036 A (HUSTED) 29 May 1951 column 3, figure 4	

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/AU 00/00273

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member	
AU	23711/97	NONE	
US	4627516	CA	1260897
US	4128139	GB	2009829
US	4095671	NONE	
US	3878918	NONE	
US	3102606	NONE	
US	2890824	NONE	
US	2835427	NONE	
US	2555036	NONE	

END OF ANNEX